DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1555-A
PAMPHLET ACCOMPANIES MAP

MINERAL RESOURCE POTENTIAL MAP OF THE WEST CLEAR CREEK ROADLESS AREA, YAVAPAI AND COCONINO COUNTIES, ARIZONA

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CORRELATION OF MAP UNITS

Qal	Qls	Holocene and Pleistocene — QUATERNARY
Qg		
QTg		Pleistocene or Pliocene — QUATERNARY OR TERTIARY
Tv		Pliocene to Miocene
Tvc		
Unconformity		
Tbv	Tb, Tts, Ta, Tds	Pliocene(?) and Upper Miocene — TERTIARY
Ts		Miocene or older
Unconformity		
Trm		Middle(?) and Lower Triassic — TRIASSIC
Unconformity		
Pk		Lower Permian — PERMIAN
Pc		
PPs		Lower Permian and Pennsylvanian — PERMIAN AND PENNSYLVANIAN

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE AND PLEISTOCENE)--Valley fill of silt, sand, and gravel including terrace deposits up to 80 ft (25 m) above canyon floor

Qls LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Unsorted rock debris

Qg GRAVEL (HOLOCENE AND PLEISTOCENE)--Terrace deposits 165-250 ft (50-75 m) above canyon floor

QTg GRAVEL (PLEISTOCENE OR PLIOCENE)--Terrace deposits more than 650 ft (200 m) above canyon floor

VERDE FORMATION (PLIOCENE TO MIOCENE)--

Tv Lacustrine facies

Tvc Conglomerate facies

VOLCANIC ROCKS (PLIOCENE(?) AND UPPER MIOCENE)

Tbv Basalt--Vent deposits; not mapped separately in canyon walls

Tb Basalt--Flows and pyroclastic deposits

Tts Silicic tuff--Nonwelded ash-flow or air-fall deposit; dacite to rhyolite

Ta Andesite--Flows, pyroclastic deposits, and intrusive plugs

Td Dike--Basalt or andesite; only most prominent ones are shown

Ts SEDIMENTARY ROCKS (MIOCENE OR OLDER)--Conglomeratic channel-filling deposits

Trm MOENKOPI FORMATION (MIDDLE(?) AND LOWER TRIASSIC)--Conglomerate, sandstone, and siltstone

Pk KAIBAB FORMATION (LOWER PERMIAN)--Dolomite, limestone, and sandstone

ss Sandstone lenses

Pc COCONINO SANDSTONE (LOWER PERMIAN)--Large scale crossbedded sandstone

PPs SUPAI FORMATION (PERMIAN AND PENNSYLVANIAN)--Siltstone, sandstone, limestone, and dolomite. Thin limestone beds in upper 330 ft (100 m) probably equivalent to Fort Apache Member

AREA HAVING LOW POTENTIAL FOR MANGANESE DEPOSITS

CONTACT--Dotted where concealed

FAULT--Dashed where inferred; dotted where concealed; bar and ball on downthrown side

LIMESTONE--Bed in Supai Formation

CINDER PIT

LIMIT OF GEOLOGIC MAPPING WHERE NOT COINCIDENT WITH BOUNDARY OF ROADLESS AREA

BOUNDARY OF ROADLESS AREA--Dotted in some areas to aid legibility

28 GEOCHEMICAL SAMPLE LOCALITY

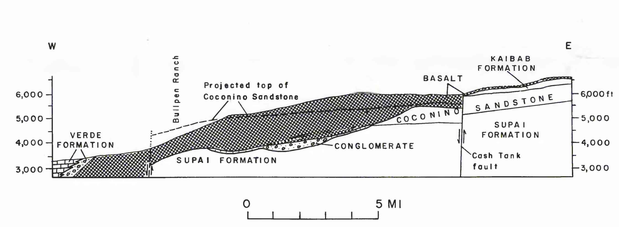


Figure 2.--Generalized longitudinal cross section of West Clear Creek canyon.

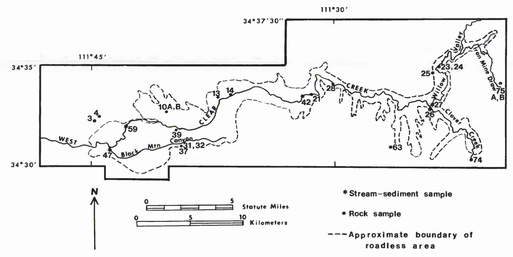


Figure 3.--Map showing locations of samples having anomalous trace-element concentrations.

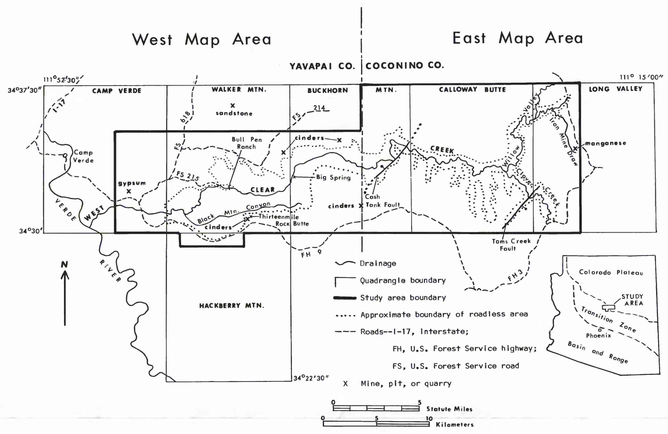
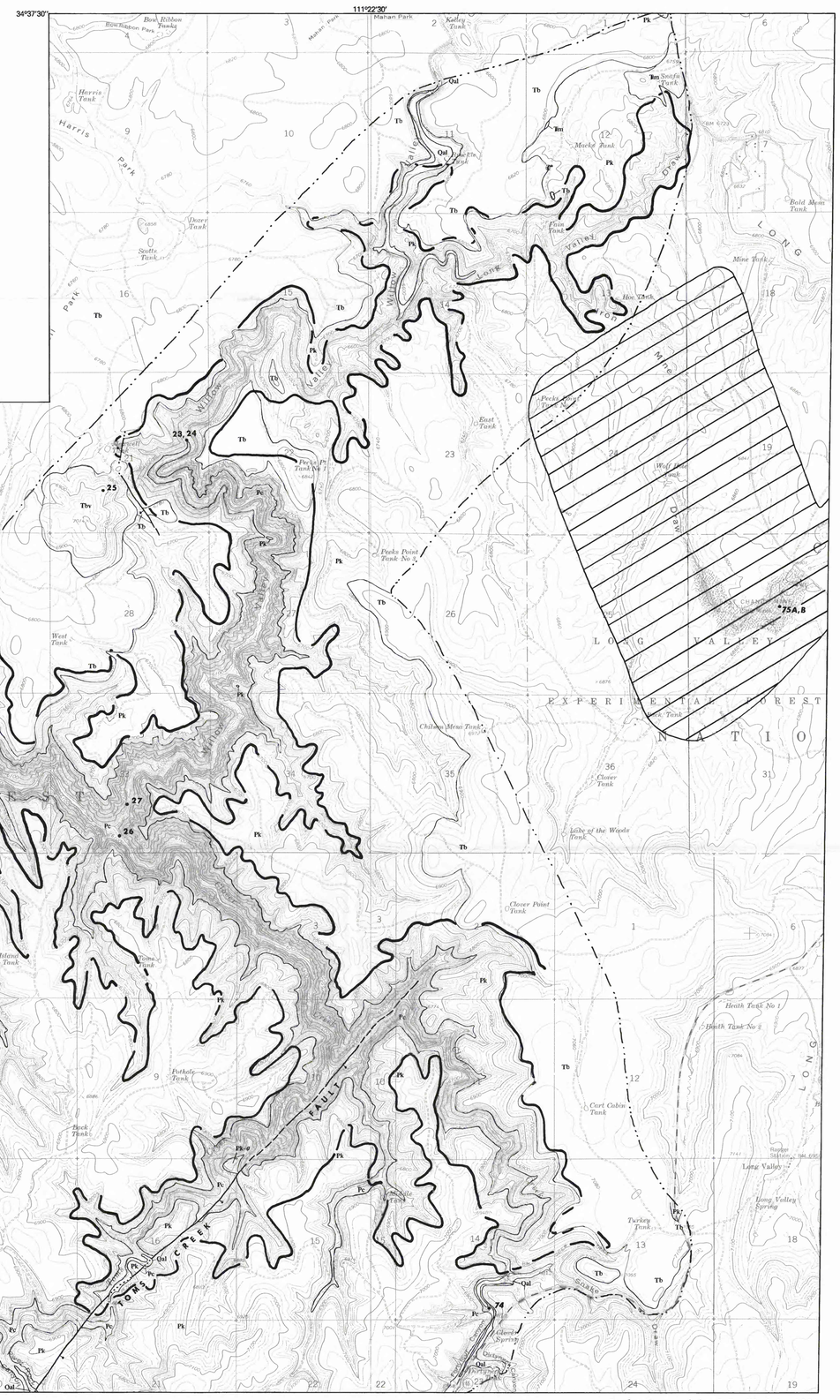


Figure 1.--Index map showing location of the West Clear Creek Roadless Area (03047), developed mineral deposits, access roads, drainages, and area boundaries.



STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the West Clear Creek Roadless Area in the Coconino National Forest, Yavapai and Coconino Counties, Ariz. The West Clear Creek Roadless Area (03047) was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

MINERAL RESOURCE POTENTIAL SUMMARY STATEMENT

The mineral resource potential of the West Clear Creek Roadless Area, Ariz., is evaluated as low on the basis of field studies performed by the U.S. Bureau of Mines and the U.S. Geological Survey during 1980. No concentrations of minerals are indicated by geochemical sampling within the roadless area. Evaporite deposits, a manganese deposit, basaltic cinders, and building stone have been mined or quarried near the area. Cinders and sandstone are found in the area but are readily available and more accessible outside the precipitous canyon of West Clear Creek.

INTRODUCTION

The West Clear Creek Roadless Area includes approximately 53 mi^2 (137 km^2) in Yavapai and Coconino Counties in central Arizona, about 70 mi (113 km) north of Phoenix (fig. 1). The area lies mainly on the southwestern margin of the Colorado Plateau and includes part of the Verde Valley, one of several northwest-trending basins in the Arizona transition zone separating the Basin-and-Range and Colorado Plateaus physiographic provinces. Its boundary closely follows the rim of the steep-walled canyon of West Clear Creek and its tributaries. The perennial stream within the canyon drops 3,010 ft (917 m) over a distance of 36 mi (57 km) from its head at the juncture of Willow and Clover Creeks to its confluence with the Verde River. Together with its tributaries, it drains an area of about 241 mi^2 (624 km^2).

GEOLOGY

The rocks of the West Clear Creek Roadless Area include cumulative exposures of approximately 1,700 ft (520 m) of upper Paleozoic sedimentary strata and an erosional remnant of Triassic red beds in the northeastern corner of the mapped area. The Paleozoic rocks are disconformably overlain by a thin basaltic cover (approximately 100 ft (30 m) thick) east of the Cash Tank fault and are overlain with angular unconformity by more than 1,475 ft (450 m) of basaltic flows and vent deposits and a few dacitic to rhyolitic ash flows in the western part of the mapped area (fig. 2).

Coarse conglomerate beds (Ts) were deposited after deep erosion and faulting of the Paleozoic rocks west of the Cash Tank fault and before all but the earliest volcanic activity, prior to 10.6-10.3 m.y. ago (Peirce and others, 1979). Younger conglomerate beds and carbonate sediments of the Verde Formation were deposited on top of the volcanic rocks on the western edge of the area as part of the basin-fill deposits covering much of Verde Valley. These deposits are intercalated with late Miocene and Pliocene(?) volcanic rocks in adjacent areas (Elston and others, 1974; E. W. Wolfe, unpub. data, 1980).

The sedimentary rocks of the West Clear Creek area dip gently westward on the southwestern flank of the Mormon Mountain anticline of Twenter and Metzger (1963). The age of folding has not been documented but is inferred to be Laramide by analogy with nearby structures in the Colorado Plateau. Structural lowering from east to west due to westward dip and faulting is approximately 2,200 ft (670 m). Most of the faults are normal, have small throws, and trend north to northwest. Two faults which are unusual in their northeasterly strikes and traceable distances (greater than 3 mi (4.8 km)) are the Cash Tank and Toms Creek faults. The Cash Tank fault is also notable in its large throw (240-360 ft (73-110 m)) and its reflection in gravity (West and Sumner, 1973) and aeromagnetic data (Davis and Ulrich, in press). The Toms Creek fault parallels the aeromagnetic contours in the area and lies on a trend that, if extended to the northeast, would coincide with the breccia zone described by Jones and Ransome (1920) in the Last Chance mine area.

GEOCHEMISTRY

Five stream-sediment and 58 rock samples were collected within the mapped area for semiquantitative spectrographic analysis for 30 trace elements and for neutron-activation analysis for uranium and thorium. Twenty-four samples have trace-element concentrations above background levels; figure 3 shows their locations. A complete listing of major and trace element analyses for the area is available as an open file report (Ulrich, 1983).

The most significant geochemical anomaly is based on analyses of two samples of the Kaibab Formation taken from the Last Chance mine in the Long Valley manganese district, 1-3 mi (1.6-4.8 km) east of the roadless area. High values of manganese, arsenic, cobalt, copper, molybdenum, and tungsten and above-background amounts of silver and beryllium are found in one or both samples (75A and B).

Three of the panned stream-sediment samples contained 500 ppm (parts per million) or more of zirconium, and one produced above-background values for cobalt, chromium, copper, and nickel. These values are interpreted as detrital concentrates derived from primarily basaltic sources upstream from the sample localities.

The volcanic rock suite, mostly basaltic and generally olivine-rich, contains expected high concentrations of cobalt, chromium, and nickel. Other elements that are found locally in concentrations above background include beryllium, copper, lead, and scandium. Uranium and thorium concentrations are locally high, especially in two basalt dikes (samples 10A and 14). Silver values of 2-7 ppm appear to be anomalous in two silicic tuff samples (13 and 32), one basaltic tuff (37), a pyroxenite clast within the conglomerate facies of the Verde Formation (4), and eight samples from the Kaibab Formation and the Coconino Sandstone. Silver in the Kaibab and the Coconino might be due to lateral migration in ground water from preexisting Precambrian highlands to the south.

The data available do not indicate highly mineralized rock within the roadless area.

GEOPHYSICS

As shown by the Bouguer map of Arizona (West and Sumner, 1973) the west half of the West Clear Creek Roadless Area has a regional gravity slope that strikes north-south and dips eastward and has a 25 mgal drop at the approximate position of the Cash Tank fault. East of that point the gradient flattens.

Aeromagnetic data (Davis and Ulrich, in press) show an irregular pattern of small high-gradient anomalies reflecting the thick section of volcanic rocks in the western and central parts of the area. Low magnetic relief in the eastern part is explained by the thin to absent volcanic cover over relatively undisturbed sedimentary rocks.

MINING DISTRICTS AND MINERALIZED AREAS

The roadless area is not part of an organized mining district. Mineralized areas, mining claims, and mining activities are limited to the Long Valley manganese district, east of the area near Iron Mine Draw, and to gypsum deposits in the Verde Valley, west of the area. Small pits and quarries in cinders and sandstone are also scattered outside the area (fig. 1).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

The mineral resource potential of the West Clear Creek Roadless Area is low. Deposits of manganese minerals trend northeast in an elongate zone in the Last Chance mine area but are not found within the roadless area. The Toms Creek fault lies along the same northeast trend but no mineralization was found in the faulted area. The Verde Formation contains gypsum deposits west of the roadless area, but none were found within the area. Basalt and basaltic cinder deposits along the canyon rim have a potential for road metal, concrete aggregate, riprap, and cinder blocks, and Coconino Sandstone may be used as building stone and flagstone, but similar construction materials are more readily available outside the area.

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For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225